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The serpent has been a symbol of long life, healing, and knowledge among almost all cultures and religions since the beginning of recorded history. This image adopted as a logotype by the Institute of Medicine is based on a relief carving from ancient Greece, now held by the Staatliche Museen in Berlin.

**COMMITTEE FOR THE STUDY ON MALARIA
PREVENTION AND CONTROL: STATUS REVIEW AND
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Preface

Despite heroic efforts to eradicate malaria in the 1950s and 1960s, this disease not only has prevailed but has made a dramatic resurgence within the past two decades. Morbidity and mortality from malaria are at almost unprecedented levels, particularly in Africa south of the Sahara, where the disease claims more than 1 million lives per year. To address this dilemma, the Institute of Medicine (IOM) was asked by the U.S. Agency for International Development (USAID) to conduct a study and present recommendations that relevant U.S. government funding agencies could use to focus their efforts in malaria research, prevention, and control. Funding for the study came from USAID, from the U.S. Army Medical Research and Development Command, and from the National Institute of Allergy and Infectious Diseases of the National Institutes of Health.

In response to the request, IOM formed the 19-member Committee for the Study on Malaria Prevention and Control. Its membership included international expertise in infectious diseases, epidemiology, economics, parasite biology, vector biology and control, clinical tropical medicine, drug and vaccine development and evaluation, molecular biology, immunology, control program management, anthropology, and ecology. The committee's recommendations evolved from its deliberations and the analysis of information from a wide range of sources, including articles from peer-reviewed journals, material published in book form, commissioned background papers, academic dissertations, unpublished case studies, presentations by

and interviews with experts, and relevant conferences and workshops. The full committee met three times during the 18-month study; the final meeting was held in January 1991.

To supplement its efforts, the committee sponsored a symposium on ethical issues in malaria research, prevention, and control at the 1990 annual meeting of the American Society for Tropical Medicine and Hygiene. In addition, several working groups were formed. The epidemiologic paradigms described in Chapter 10 were drafted by a working group composed of several committee members, IOM staff, and representatives of the World Health Organization (WHO). Another working group was convened to address more fully some of the issues related to host immunology and vaccine development. Finally, nine- and six-member subcommittees were constituted and tasked to refine the conclusions and recommendations developed at the third committee meeting and to respond to the comments of the National Research Council's Report Review Committee.

The committee sees its report as a source of information and guidance that can be used in several ways, depending on the reader's perspective and interests. Readers who seek only the committee's conclusions and recommendations are directed to Chapter 1. Chapters 2 and 3 will be of particular interest to readers who are unfamiliar with malaria. Those who wish to delve still deeper into the biomedical aspects of the disease can read Chapters 4 through 12, which provide state-of-the-science information as well as research agendas that offer more precise avenues for advancing knowledge in specific areas.

As an appendix to this report, the reader will find a statement of dissent by committee member Awash Teklehaimanot. Overall, the committee believes that most of the concerns expressed by Dr. Teklehaimanot are, in fact, addressed in the report. The committee's charge was to assess the status of malaria research and control and make recommendations as to how the United States, as the largest single supporter of malaria research and control activities worldwide, could best contribute to global efforts to control the disease. Writing a "how-to" manual on malaria research and control was not a part of that charge. Rather, over the course of 18 months, the committee identified major challenges and obstacles in the science base and in the implementation of the current armamentarium of interventions for prevention and control. It then formulated specific recommendations on how U.S. support could be most effective in stemming the world's growing malaria problem.

The committee calls for sustained U.S. and international support for malaria control activities; a renewed commitment by donor agencies to support national programs; and extensive support for training of individuals from malaria-endemic countries in research, prevention, and control. The committee firmly believes that the United States' most effective contribu-

tion will come from support of a balanced agenda for both research and control: to develop the new tools that are desperately needed, to test and apply those tools appropriately and economically, and to utilize more contextually specific and rigorous approaches to U.S.-supported malaria control activities in countries where the disease is endemic.

The committee is hopeful that the conclusions and recommendations it offers will provide the impetus for critical decisions and for needed research, which will allow progress to be made in the global fight against malaria.

Charles C. J. Carpenter, *Chair*
Committee on Malaria Prevention and Control

Acknowledgments

This is perhaps the most difficult portion of the report to write, for fear of failing to acknowledge an individual or organization. Many people outside of the committee contributed to this study in various ways. Some prepared commissioned papers or provided relevant funding information; others participated in the symposium, the joint World Health Organization/Institute of Medicine effort to draft the paradigms, or the Immunology and Vaccine Development Working Group. Still others provided organizational information as members of the Liaison Panel. All of these contributors and others who provided the committee and staff with material for use in the study are listed on the following pages. To all of you, we offer our sincere appreciation.

The committee is particularly grateful to the following individuals, who came from their busy schedules (and, in some cases, traveled great distances) to express their viewpoints and answer the many questions posed to the committee: Carlos C. Campbell of the Centers for Disease Control; Chitprapong of the Malaria Center in Chiangmai, Thailand; Deberati Ghosh of the University of Louvain, Brussels; Bernhard Liese of the University of Bonn; and Milton Tam of DiaTech, Program for Appropriate Technology and Health. Thanks are also due to the staff of the American Association for the Advancement of Science's project on malaria in Africa, director of the Sub-Saharan Africa Program, for their cooperation and coordination with the Institute of Medicine study staff.

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